

**Abstract**

[0094] The light-emitting device includes a light source and a gradient index (GRIN) element. The GRIN element has a cylindrical refractive index profile in which the refractive index varies radially and is substantially constant axially. The  
5 GRIN element includes a first end surface opposite a second end surface and is characterized by a length-to-pitch ratio. The GRIN element is arranged with the first end surface adjacent the light source to receive light from the light source, and emits the light from the second end surface in a radiation pattern dependent on the length-to-pitch ratio. Since the radiation pattern depends on the length-to-pitch ratio of the  
10 GRIN element, LEDs with different radiation patterns can be made simply by using GRIN elements of appropriate lengths.